

**What Is Claimed Is:**

1           1.    A method of reducing an aspect ratio of a trench,  
2 comprising the steps of:  
3           forming a trench in a substrate;  
4           using HDP-CVD to form a conformal first oxide layer on a  
5           surface of the trench;  
6           forming a conformal first nitride layer on the first oxide  
7           layer;  
8           removing part of the first nitride layer to cause the first  
9           nitride layer to be lower than a top surface of the  
10          substrate; and  
11          using a BOE solution to remove the first nitride layer and  
12          part of the first oxide layer, thus forming a  
13          remaining first oxide layer on the surface of the  
14          trench at a lower portion.

1           2.    The method according to claim 1, further comprising  
2 at least one cycle of the steps of:  
3           using HDP-CVD to form a conformal second oxide layer on the  
4           remaining first oxide layer and the surface of the  
5           trench;  
6           forming a conformal second nitride layer on the second  
7           oxide layer;  
8           removing part of the second nitride layer to cause the  
9           second nitride layer to be lower than a top surface  
10          of the substrate; and  
11          using a BOE solution to remove the second nitride layer and  
12          part of the second oxide layer, thus forming a

13               remaining second oxide layer on the remaining first  
14               oxide layer.

1           3.    A method of reducing an aspect ratio of a trench,  
2   comprising the steps of:

3           (a)providing a substrate;  
4           (b)forming a trench in the substrate;  
5           (c)using HDP-CVD to form a conformal first oxide layer on  
6               a surface of the trench;  
7           (d)forming a conformal first nitride layer on the first  
8               oxide layer;  
9           (e)forming a first photoresist layer in part of the trench  
10               to cover part of the first nitride layer, wherein the  
11               first photoresist layer is lower than a top surface  
12               of the substrate;  
13           (f)using the first photoresist layer as a mask, removing  
14               part of the first nitride layer;  
15           (g)removing the first photoresist layer; and  
16           (h)using a BOE solution to remove the first nitride layer  
17               and part of the first oxide layer, thus forming a  
18               remaining first oxide layer on the surface of the  
19               trench at a lower portion.

1           4.    The method according to claim 3, further comprising  
2   at least one cycle of the steps of:

3           (i)using HDP-CVD to form a conformal second oxide layer on  
4               the remaining first oxide layer and the surface of  
5               the trench;  
6           (j)forming a conformal second nitride layer on the second  
7               oxide layer;

8           (k) forming a second photoresist layer in part of the trench  
9           to cover part of the second nitride layer, wherein  
10          the second photoresist layer is lower than a top  
11          surface of the substrate;  
12          (l) using the second photoresist layer as a mask, removing  
13          part of the second nitride layer;  
14          (m) removing the second photoresist layer; and  
15          (n) using the BOE solution to remove the second nitride  
16          layer and part of the second oxide layer, thus forming  
17          a remaining second oxide layer on the remaining first  
18          oxide layer.

1          5.    The method according to claim 3, wherein the first  
2    photoresist layer is at least 1000Å lower than a top surface of  
3    the substrate.

1          6.    The method according to claim 4, wherein the second  
2    photoresist layer is at least 1000Å lower than a top surface of  
3    the substrate.

1          7.    The method according to claim 3, wherein the formation  
2    of the trench comprises the steps of:  
3          forming a shield layer on part of the substrate; and  
4          using the shield layer as a mask, etching part of the  
5          substrate to define the trench therein.

1          8.    The method according to claim 7, wherein the shield  
2    layer comprises a pad oxide layer and a silicon nitride layer.

1          9.    The method according to claim 3, further comprising,  
2    prior to forming the first oxide layer, a step of:

3           forming a conformal linear layer on the surface of the  
4           trench.

1           10. The method according to claim 3, wherein the first  
2 oxide layer is a SiO<sub>2</sub> layer.

1           11. The method according to claim 3, wherein the nitride  
2 layer is a Si<sub>3</sub>N<sub>4</sub> layer formed by LP-CVD.

1           12. The method according to claim 3, wherein an etching  
2 rate of the first oxide layer with the BOE solution is  
3 280~320Å/min, and an etching rate of the first nitride layer with  
4 the BOE solution is 8~12Å/min.

1           13. The method according to claim 12, wherein a thickness  
2 of the first oxide layer is 200~300Å, and a thickness of the first  
3 nitride layer is 40~50Å.

1           14. A method of reducing an aspect ratio of a trench,  
2 comprising the steps of:

3           (a)providing a silicon substrate;

4           (b)forming a trench in the silicon substrate

5           (c)using HDP-CVD to form a conformal first oxide layer on  
6           a surface of the trench, wherein a thickness of the  
7           first oxide layer is 200~300Å;

8           (d)forming a conformal first nitride layer on the first  
9           oxide layer, wherein a thickness of the first nitride  
10           layer is 40~50Å;

11           (e)forming a first photoresist layer in part of the trench  
12           to cover part of the first nitride layer, wherein the

13           first photoresist layer is at least 1000Å lower than  
14           a top surface of the substrate;  
15       (f)using the first photoresist layer as a mask, removing  
16           part of the first nitride layer;  
17       (g)removing the first photoresist layer; and  
18       (h)using a BOE solution to remove the first nitride layer  
19           and part of the first oxide layer, thus forming a  
20           remaining first oxide layer on the surface of the  
21           trench at a lower portion, wherein an etching rate  
22           of the first oxide layer with the BOE solution is  
23           280~320Å/min, and an etching rate of the first  
24           nitride layer with the BOE solution is 8~12Å/min.

1       15. The method according to claim 14, further comprising  
2       at least one cycle of the steps of:  
3       (i)using HDP-CVD to form a conformal second oxide layer on  
4           the remaining first oxide layer and the surface of  
5           the trench;  
6       (j)forming a conformal second nitride layer on the second  
7           oxide layer;  
8       (k)forming a second photoresist layer in part of the trench  
9           to cover part of the second nitride layer, wherein  
10           the second photoresist layer is at least 1000Å lower  
11           than a top surface of the substrate;  
12       (l)using the second photoresist layer as a mask, removing  
13           part of the second nitride layer;  
14       (m)removing the second photoresist layer; and  
15       (n)using the BOE solution to remove the second nitride  
16           layer and part of the second oxide layer, thus forming

17           a remaining second oxide layer on the remaining first  
18           oxide layer.

1       16. The method according to claim 14, wherein the  
2       formation of the trench comprises the steps of:  
3       forming a shield layer on part of the silicon substrate;  
4       and  
5       using the shield layer as a mask, etching part of the  
6       silicon substrate to define the trench therein.

1       17. The method according to claim 16, wherein the shield  
2       layer comprises a pad oxide layer and a silicon nitride layer.

1       18. The method according to claim 14, further comprising,  
2       prior to forming the first oxide layer, a step of:  
3       forming a conformal linear layer on the surface of the  
4       trench.

1       19. The method according to claim 14, wherein the first  
2       oxide layer is a SiO<sub>2</sub> layer.

1       20. The method according to claim 14, wherein the nitride  
2       layer is a Si<sub>3</sub>N<sub>4</sub> layer formed by LP-CVD.